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IN THIS ISSUE

Buffel Grass Special Issue

From the Guest Editor...

Why buffel grass? Over the years the Department has received a large number of queries about all aspects of buffel grass, and hopefully this edition of the *Rural Review* goes some way to answering these queries. However, also over the years the questions have changed. While earlier queries were about the actual physical establishment of buffel grass, more recently the questions have concerned the value of buffel grass. I take that as indicating a change in the general perception of, and attitude towards, buffel grass. It seems that it is no longer considered by all to be the answer to all the pastoralists' prayers, but is now considered by many to be only suitable for use in some areas and requires special management. It seems some people love it and others hate it and there are very few in between. In this edition I have tried to present a balanced view of buffel grass and armed with these facts and ideas people can reassess their own attitudes.

The buffel section of this *Rural Review* covers the history in Central Australia, put together by Coral Allan from the Rangeland Production Section. Andrew Wilkie from the Rangeland Production Section helps to identify the different types of buffel that have been introduced and any closely related grasses. Then Gail Bohning again from the Rangeland Production Section, using some of the results from blade ploughing trials, tries to make sense of why buffel establishment seems to be inconsistent. Pat Lawler from the Animal Production Section looks at some surprising results from nutritional work done on buffel and native grasses in the 1970s. Peter Latz, well-known Central Australian plant ecologist with the Parks and Wildlife Commission also gives his personal view on the long-term value of buffel grass to the pastoral industry. Finally, the issue of buffel grass in parks and how the attitude has changed since the 1970s is presented by David Albrecht, Botanist and Brenda Pitts, Plant Ecologist with P&WC. I thank them all for their contributions.

It has been a privilege for me to be the first guest editor of the new look *Rural Review*. I don't know if Lyn Johnson, the usual editor and compiler, has found it easier or more difficult trying to keep just me happy or the usual six or so contributors, but I have certainly found it an interesting experience. I hope you, the reader , find the idea of having a unique "concept" for an issue of the *Rural Review* worthwhile, and look forward to your feedback.

Andrew White

Rangeland Production

A BRIEF HISTORY OF BUFFEL GRASS IN CENTRAL AUSTRALIA

Coral Allan, Rangeland Production

Buffel grass (*Cenchrus ciliaris*) is a perennial native to Africa, India and Indonesia and is now well established throughout Central Australia. There are many ideas on how and when buffel grass first came to Australia. One is that it was accidentally introduced into Wallal on the north-west coast of Western Australia in Afghan camel harnesses between 1870 and 1880.

Introduction of new grasses to Central Australia probably started late last century when camel trains were used for transport. Afghans usually padded their saddles with buffel grass seed. Seed from the saddle padding was obviously spread at old camping sites and provided our arid zone with one of its first accidentally introduced pastures. The first official record of buffel grass in Alice Springs was in 1930 when a Queensland botanist C. T. White identified a buffel grass specimen from the area.

During the early 1960s buffel grass trials for pasture improvements were established on a variety of properties in the Alice Springs and Barkly Tablelands areas. The areas chosen for the project were of varying soil and climatic conditions. The results from the trials established buffel grass as a hardy and drought resistant plant, engaging support for the grass from landholders participating in the trials and many others.

Some of the stations and other areas involved in the trials included Brunchilly Station (early 1960s), Erldunda Station (1961), Alice Springs "Farm" area (1961), Mt Ebenezer Station (1963), Alice Springs Commonage area (1964), Yambah Station (1966), Bond Springs Station (1968), Owen Springs Station (1970s), Alice Springs Airport area for dust control (1970s) and Undoolya Station (1974).

Buffel grass will not readily establish on eroded or scalded areas without some form of mechanical seed bed preparation such as pitting or ripping. Once established it will withstand persistent heavy grazing and is therefore ideally suited to holding paddocks and areas close to watering points. Buffel grass has been used extensively in land reclamation and dust control projects in Central Australia in the Alice Springs Commonage and Alice Springs Airport areas.

BUFFEL GRASS - WHICH ONE IS IT?

Andrew Wilkie, Rangeland Production

There are several different buffel grass (*Cenchrus ciliaris*) varieties which have been introduced into Central Australia. The most common are the Biloela, Gayndah, American (USA) and Western Australia (WA) varieties of buffel grass. While these varieties are quite distinct, it has recently been suggested that many of the buffel plants encountered in Central Australia may indeed be hybrids or crosses of these varieties. Whether this is true or not, a couple of simple plant characteristics can be used to "roughly" identify between the varieties. The following description of parts of the grass plant are taken from *The Grasses of Central Australia* by M. Lazarides and may help in identifying the different strains of buffel grass.

The stems of a grass plant may be
erect (vertical)
ascending (obliquely spreading then erect)
decumbent (spreading along the ground before becoming erect)
prostrate (creeping)
Within the stems of grasses are a number of joints or **nodes** which are often the starting point for leaves, shoots, branches and roots.

The height of the plant, stem characteristics and the difference in seed heads are the easiest visual characteristics to use when looking at buffel grass cultivars (cv).

The taller varieties

buffel grass

cv. Biloela
This variety was commercially released from the Biloela Research Station in 1950. The plant structure is e**rect** growing to a height of **1.5m**. Number of nodes in stems is **7-11**. The seed head is cylindrical, approximately 7cm long, straw coloured (usually white to a very light pink) and "fluffy".

The shorter varieties

cv. Gayndah
Introduced from Kenya in 1930s and planted by school children in grounds of the Gayndah State School. The plant structure is **semi-prostrate to ascending**. Growing to a height of **1m**. Number of nodes in stem is **11-18**. The seed head is cylindrical, pale to red in colour and loosely packed or "fluffy". When the plant has hayed off the seed head may turn a dull white colour.

cv. American (USA)
Imported commercially from USA to Australia in 1956. The plant structure is **semi-prostrate to ascending**. Growing to a height of **1m**. Number of nodes in stem is **6-10**. The seed head is cylindrical however only the upper part of the bristles in the seed head are purple. When the plant has hayed off the seed head may turn a dull white colour. Distinguished from the cv. Gayndah by the number of nodes in the stem.

cv. Western Australia (WA)
Believed to be introduced into WA in camel packs in 1870-1880. The plant structure is **tussocky and short,** growing to a height of **45-75cm**. Stems have **5-8** nodes. The seed head tends to be dense and "tight" and intensely purple.

Apart from these varieties there are also a number of related species that may be found in central Australia including Birdwood grass (*Cenchrus setigerus*) and Mossman River grass (*Cenchrus echinatus*).

Related species

Birdwood grass

Birdwood grass

Birdwood grass *(Cenchrus setigerus),* named after General Birdwood who collected and sent seed to WA from Afghanistan during WW1, is similar in appearance to both Gayndah, American or WA buffel, but can be distinguished from these by the seed head. The seed head of Birdwood grass is tightly packed and dense with very few bristles and when mature is usually a light brown to grey in colour.

Mossman River grass

Mossman River Grass (*Cenchrus echinatus*) can look similar to buffel grass until it seeds.

Mossman River grass

Once it seeds it is easily identified by the solid, rigid spines in the seed head. This plant is a declared plant (Class B) of the Northern Territory and if identified should be controlled.

Drawings reproduced from Flora of New South Wales, Volume 4 *with permission of the University of New South Wales Press.*

SUCCESS AND FAILURE OF BUFFEL GRASS ESTABLISHMENT

IN CENTRAL AUSTRALIA

Gail Bohning, Rangeland Production

It is well recognised that Australian soils are some of the oldest and most nutrient deficient in the world. Like most introduced grasses, buffel grass has a demand for reasonable soil fertility in the form of available nitrogen and phosphorus. The required level of phosphorus for buffel grass to germinate and colonise can mainly be found on flood plains and calcareous soils in Central Australia. Research carried out during the 1950s found levels of phosphorus in flood-plain soils to be 2½ times greater than in mulga areas and over 6 times greater than spinifex areas. This may explain the ability of buffel grass to thrive there when compared to the infertile red soil areas where it has been reported to gradually decrease over time. It is well recognised that buffel grass favours alluvial areas where a continued and successful natural colonisation occurs.

On poorer red earths the chief nutrients limiting the establishment and growth of buffel grass were found to be phosphorus and nitrogen. Research in East Africa found that no natural spread of buffel grass occurred on soils of pH lower than 7.0, although establishment was good on low pH soils following cultivation. Recent investigations by the DPIF following blade ploughing of mulga and mulga/spinifex country revealed three out of four sites cleared of mulga and sown to buffel grass showed initial good establishment following cultivation. However over a four year period the density and frequency of the buffel plants decreased.

Local research has indicated that increases in fertility can occur on the poorer red soils immediately following blade ploughing. This is the result of the soil disturbance caused by the ploughing which in turn stimulates the mineralisation process. This means there is a large increase in the flow of nitrogen from the organic pool (plant matter both living and dead) to the mineral pool (as mineral nutrients within the soil). Soil microorganisms break down the relatively complex forms of nitrogen in the organic pool and convert it to a simple form which becomes part of the mineral pool (see diagram below). Grasses can only use these simple forms of nitrogen in the mineral pool. As a result of this large increase in available nitrogen in the soil, pasture growth and productivity is greatly elevated for the first few years. This is followed by a gradual run down of the pasture as nitrogen in the mineral pool is used and accumulates in the organic pool as new plant growth and eventually a state of equilibrium is reached. At this stage available nitrogen limits the growth of buffel grass and the pasture returns to a level of available nitrogen, similar to native pasture. This run down affect may only take a few years on some soil types.

Figure 1 The circulation of nitrogen in a pasture.

This figure has been provided by the Department of Primary Industries, Queensland, from their book, *The Buffel Book*, published by the DPI Queensland.

NUTRITIONAL VALUE: BUFFEL VERSUS TWO NATIVE GRASSES

Pat Lawler, Animal Production

Back in 1976, somebody out here at AZRI chose one patch of buffel, one of oat grass and another of woollybutt grass to compare nutrition of different species. Up until about 1980, monthly samples were collected and analysed for

1. **protein**
2. **phosphorus**
3. **digestibility**

This local data suggests that for all three aspects of nutrition, the three grasses are ranked in the following order:

- buffel
- oat grass
- woollybutt

Three points to remember:

- the information here is useful to compare the grasses but cannot be taken as scientific proof because there was no replication and site differences exist.
- these four years all had well above average rainfall with wet summers
- oat grass is an annual grass compared with the others which are perennial. This means it has an shorter active growth period.

Protein

Cattle need at least 6% crude protein in their diet to maintain weight. During the sampling period, the buffel grass ranged from 2% to 14% crude protein. Crude protein in buffel was only greater than the 6% minimum requirement in one third of the monthly samples.

Table 1 compares protein in all three grasses.

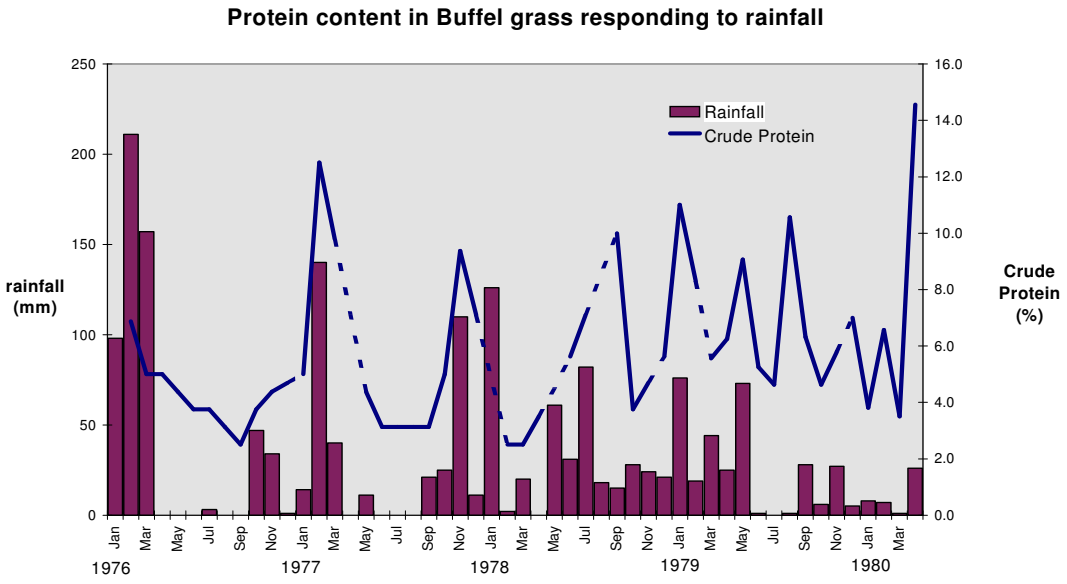
Table 1

Species	Range of Crude Protein (%)	Proportion of monthly samples above 6% CP
buffel	2 - 14	1/3
oat grass	2 - 12	1/7
woollybutt	2 - 8	1/12

Figure 1 below shows how protein in this patch of buffel increased after rain.

- Protein peaks quickly as the plant actively grows in response to rain.
- Summer and winter rain results in similar protein levels.
- The protein 'boost' does not last. Levels fall rapidly as the plant matures and sets seed, even if it is still raining.
- Only 1/3 of the plant's life is spent above the critical 6% crude protein level.

Figure 1
Broken lines indicate no sample taken.



Phosphorus

In Table 2 each grass is ranked into levels of phosphorus nutrition for cattle. In this case, cattle on a pure buffel pasture would receive adequate phosphorous for 90% of the time. It is important to remember that phosphorus nutrition in cattle is very dependent on the available soil phosphorus.

Table 2

	Level of phosphorus nutrition			
	Acutely Deficient	**Deficient**	**Marginal**	**Adequate**
buffel			10%	**90%**
oat grass		20%	**65%**	15%
woollybutt	5%	**85%**	10%	

In Figure 2 we see once again that the phosphorus peaks coincide with the rainfall peaks and active plant growth. Unlike protein, the highest phosphorus peaks usually only occur with summer rain.

Digestibility

The digestibility of feed material determines how fast it can be digested. Therefore the digestibility of the diet affects the rate at which cattle can feed and hence grow.

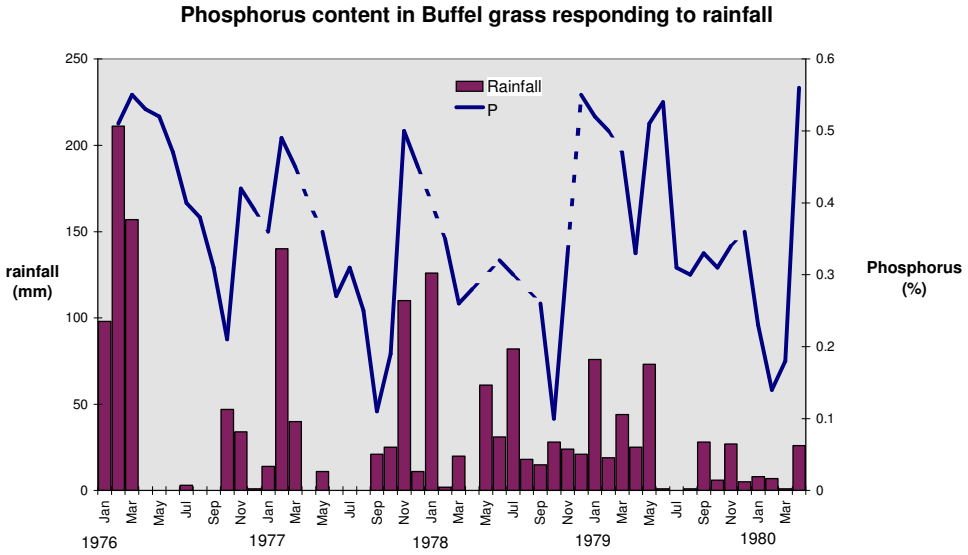
Some species are more digestible than others. The greener the feed material, the more digestible it is.

buffel	*40 - 70% digestible*
oat grass	*40 - 60% digestible*
woollybutt	*20 - 50% digestible*

Conclusion

The data presented here suggests that in terms of **protein, phosphorus** and **digestibility,** buffel has more to offer than oat grass, and woollybutt comes last of all. This does not take into account that buffel and woollybutt are perennials whereas oat grass is an annual. The growing season is much shorter for oat grass which limits the period over which it offers grazing nutrition. This comparison does not consider other issues which contribute to a grass' grazing value, such as yield

Figure 2



LAND RESOURCES DIVISION, DLPE

The Land Resources Division of the Department of Lands, Planning and Environment has moved to new premises at the rear of the Water Resources Building, North Stuart Highway Alice Springs. The fax number is ((08) 8951 8510. Contact phone numbers:

Russell Grant	Manager	8951 8517
Peter Jessop	Pastoral Land Management Branch	8951 8596
Mandy Bowman	Resources Capability Assessment Branch	8951 8520
Alison Kennedy	Land Resource Conservation Branch	8951 8514
Ann Grattidge	Landcare Branch	8951 8556

BUFFEL GRASS - PEST OR PROFIT-MAKER?

*** A botanist's view on the usefulness of this grass to the cattle industry.**

** P K Latz, Plant Ecologist*
Parks and Wildlife Commission of the NT

Facts?

I think there are several points that most people will not dispute with respect to buffel grass. These are: -

(1) Buffel grass growing on limestone country is a good pasture grass. In Africa, where it occurs naturally, it only grows on limestone soils. However, it also appears to do well on a variety of soil types in Central Australia where it is generally 'sweet' and palatable to cattle, and will respond well to heavy grazing.

(2) Buffel grass can establish everywhere in Central Australia except on red or heavy clay soils. (The red soils include most spinifex and mulga areas.) Even if it does establish on red soils in good seasons, it will usually die out after the first drought.

(3) Euros like buffel grass and will graze it heavily, especially on spinifex hills.

(4) Research in the Simpson Gap National Park has shown that individual buffel plants will live for at least 20 years. In the last 25 years buffel grass has increased from covering about 5% of the creek and creek-frontage area to now cover 60% of this habitat. This increase has been aided by fire (which buffel likes) and rabbits (which eat everything else before they touch buffel grass). It is causing a serious problem in this Park because it is severely reducing biodiversity and increasing the severity of wildfires (thereby killing Red Gums and other trees).

(5) Termites do not like buffel grass and will only eat it after it is very old. This increases the fire problems as fuel loads increase.

Conjecture

Except on limestone areas, I personally believe buffel grass will eventually bring about a reduction in grazing productivity in Central Australia! When buffel grass is first introduced into cattle country stock generally do very well on it. Initially there are plenty of native grasses and forbs around - the cattle fatten and breed on the nutrients from the native plants and then fall back onto the buffel grass when times get tough (dry). The only trouble is that eventually they will eat out all the 'sweet' native tucker leaving only buffel grass and nothing else. In this situation pastoralists will be able to run more stock in any given area but the cattle will not do as well because the sweet short grass which makes Central Australia a prime grazing area have been lost.

The whole purpose of having high biodiversity is that you are not "putting all your eggs in one basket". High biodiversity allows a lot more flexibility to cope with the many and varied 'tricks' our desert can come up with. An example comes to mind. A caterpillar or grasshopper that loves buffel grass could turn up and have a wonderful time (the danger of having a mono-culture). If you lose your native plants from pastures then all that can happen is that another introduced plant (or plants) will take over, and you can bet these will probably be useless weeds.

BUFFEL GRASS ON PARKS AND WILDLIFE COMMISSION RESERVES

David Albrecht, Botanist, Brenda Pitts, Plant Ecologist
Parks and Wildlife Commission of the NT

It may come as a surprise to some people that the occurrence of buffel grass on park estate is perceived as a problem by PWCNT. This contemporary view contrasts with our opinion that prevailed up to as recently as the mid 1970s when buffel was still being planted on park estate for revegetation and erosion control purposes.

Buffel grass is perceived as a problem on parks because of its ability to modify vegetation structure and reduce overall species biodiversity. In favourable habitats it grows prodigiously after good rains, competing aggressively with native plant species and producing high fuel loads that threaten native species and plant communities that are sensitive to frequent fire. Effects on native insects and vertebrates is as yet unresearched but buffel will almost certainly be found to reduce suitable habitat for these species.

Buffel grass occurs on virtually all PWCNT reserves, and in some parks, its abundance appears to be increasing at a rather alarmingly rate. It favours creeks, alluvial plains, calcareous areas and rocky ranges, and is highly invasive in these areas. Fortunately buffel does not appear to invade sandy spinifex country or unburnt mulga on red earth plains.

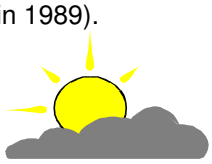
PWCNT staff have undertaken control work in some parks and we are presently seeking funding to research more effective methods of control for buffel on the park estate. The implementation of a more intensive control program would be at a considerable cost. However if we choose to ignore the problem, the conservation and scenic values of our parks could be severely compromised. Invasion of buffel grass into parks from adjacent pastoral properties is of concern, especially if intensive control programs are being undertaken within parks. We may need to look at the possibility of creating buffer zones between parks and adjacent pastoral properties where the abundance of buffel is kept at a low level.

JULY WEATHER REVIEW

Temperatures: Day temperatures were below normal in the southern parts of the Alice Springs district. Some areas around Jervois and Watarrka recorded more than three degrees below normal. Watarrka reported the lowest monthly mean maximum of 18.4°C. This was mostly due to the cool southeasterly air stream which prevailed during the month. Yulara AWS recorded (unconfirmed) 5.9°C (12th). This was the lowest maximum ever recorded at any Territory station.

Minimum temperatures were about average except a few areas in the Alice Springs district where they were below normal. Some areas recorded more than two degrees below normal. Kulgera recorded the lowest for the month of -3.7°C (21st).
Snow: Eye witnesses reported seeing snow at Yulara on the 11th. There is no evidence of any previous reports of snowfall in the Territory.
Frost: Alice Springs reported 24 frost days for July. The highest in the last 57 years was 25 days in 1977.

Rainfall: No rainfall was reported in the Barkly district for the month. Southern parts of the Alice Springs district received above average rainfall due to the north west cloud bands associated with the frontal systems which moved through the southern parts of the continent. The highest daily rainfall of 13.6mm on the 12th was reported from Wararrka. Glen Helen reported the record rainfall of 11.8mm (previous record in 7 years was 9.0mm in 1989).



WEATHER DETAILS SUPPLIED COURTESY OF THE BUREAU OF METEOROLOGY, DARWIN

RURAL YOUTH FORUM

The DPIF invites young people between the ages of 13 and 25 years to attend a Rural Youth Forum on 26 September at AZRI Alice Springs.

The Forum will address a variety of topics including the DPIF's vision for rural industries in the NT, diversification of the pastoral industry, breeding to suit markets, career planning, marketing, women in rural industries and safety issues. Speakers will come from the Department and from industry

To register your interest or for further information contact Di Wade, DPIF Alice Springs.

Ph: (08) 8951 8102 or Fax: (08) 8951 8112

BOTULISM - 1997 UPDATE

There have been some stock deaths in the Alice Springs area over the past couple of months. Although lab results are not conclusive, in some cases botulism is suspected to be the cause. In all cases we have been confident enough to recommend the start of a vaccination program.

In the Alice Springs area it would seem that the disease is not going to give problems every year. This probably links back to the summer season that has just passed. Big rains do not necessarily mean the best grass. It is more likely that a big rain will let you down in the nutrition stakes The next link is when stock start bone chewing. This is when botulism can flare up. By the time you notice the start of bone chewing it will be too late for some stock.

Another factor in recent years is the constant import of stock from other areas. Some of these would undoubtably carry the bug and be a source of the disease, and means that the disease can occur in new areas. Therefore removing the source by burning carcasses is still a good policy. Animal Health Section will investigate any reported stock deaths.

Pastoralists may be aware that Cyanamid Websters has recently marketed a new botulism vaccine called Singvac. The DPIF intends to update the botulism Agnote with information on Singvac and best bet ,cost effectiveness of a vaccination program to suit the Alice Springs district.

ABC RADIO 1997 RURAL WOMAN OF THE YEAR

Congratulations to **Mary Goodacre**, DPIF's Regional Director Tennant Creek, on becoming the Northern Territory 1997 Rural Woman of the Year. The award recognises the vital contribution made by women to primary industry. Mary will represent the Northern Territory in the national judging to be held in Sydney later in the year.

PMP DIARY AND YOU

The Property Management Planning diary/notebook is once again up for review. The decision to reprint in 1998 will be made on the basis of the demand from rural land holders.

You will be receiving a 2-page questionnaire in the mail. DPIF need to know if you would like the diaries reprinted again in 1998, and the layout best suited to your needs.

Please take the time to fill in the questionnaire and return it by 20th September 1997. Any enquiries can be directed to Scott Grimster - DPIF Marketing on (08) 89 992013.